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REDESCRIPTION OF *ACROPHYTUM CLAVIGER* (COELENTERATA : OCTOCORALLIA)

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ABSTRACT

Acrophytum claviger Hickson, a little known soft coral from South African waters, is redescribed from one of Hickson's original specimens. The specimen is designated as a paralectotype. Photographs and sclerite drawings supplement Hickson's sparsely illustrated paper, as do histological data from an additional specimen containing an unusual reproductive stage. A comparison is made between *A. claviger* and *Minabea robusta* Utinomi and Imahara, but the two taxa appear distinct.

KEYWORDS: *Acrophytum*, Coelenterata, Alcyonaria, Octocorallia, Embryology, South Africa.

INTRODUCTION

I recently had cause to examine a specimen of *Acrophytum claviger*, deposited in the Manchester Museum and used by Hickson in his original account, to investigate its similarity to some Australian specimens of *Minabea* Utinomi, 1957. As Hickson's original paper is poorly illustrated, and unclear in several aspects, this redescription was considered necessary.

In his 1900 publication Hickson neglected to designate any individual type status of specimens in his type-series. Since completing the description that follows I have obtained information that the rest of Hickson's material is in the British Museum (Natural History). One specimen is labelled 'syntype' and is the larger, and figured specimen, of Hickson's type-series. The other is labelled 'schizoparatype' and appears to be fragments removed from the specimen described below. The former specimen (BM. 1901. 7.6.2.) is hereby designated as the lectotype and the specimen from Manchester, which is the subject of this paper, is designated as a paralectotype.

SYSTEMATICS

Acrophytum claviger Hickson
(Figs 1-6)

Acrophytum claviger Hickson, 1900 : 74-77, Pl. IV, Figs B-B'; Thompson 1921: 170-171; Broch 1939:58.

Metalcyonium natalensis Thompson, 1910: 559-562, Pl. III, Figs. 15, 18, Pl. IV, Figs 39 a-c. (syn. by Thomson 1921:170-171).

Type material. PARALECTOTYPE - IDEN No. 1622, Manchester Museum, University of Manchester, England. Collection data: Algoa Bay, 26 fathoms, 6 December 1898.

Additional material. S.A.M.-H1039, South African Museum, Cape Town, South Africa. Fish Point Lighthouse NW, 35 fms, trawl, 20 May 1905, Coll. S. S. Picter Faure.

Description. The paralectotype, the smallest of Hickson's 2 original specimens, is 70mm in length. The polyparium is widest at its base, 21mm, and the more or less cylindrical stalk is 16mm in diameter and 23mm long. The surface of the stalk is wrinkled both transversely and longitudinally. The colour of the colony is generally pale grey with pale brown autozooids.

A 28mm long wedge-shaped piece of coenenchyme has been removed from one side of the polyparium exposing the grey, dense jelly-like interior which imparts a firm rubbery consistency to the colony (Fig. 1). Polyp cavities, brown retracted autozooids, reproductive bodies and gastric canals can be seen in the cut surfaces (Fig. 2).

Although dissection of the colony was limited to small sclerite samples only, and no serial sectioning was performed, Hickson's diagnosis of dimorphism appeared to be accurate and was confirmed

Fig. 1. *Acrophytum claviger*, paralectotype, X 2.

by histological examination of an additional specimen, as described later in this paper. Close examination of the incised area of Hickson's specimen reveals large, small and intermediate sized polyp cavities in the translucent coenenchyme. Autozooid cavities with expanded anthocodiae above them, or containing partially withdrawn anthocodiae, are visible in both adult and juvenile stages, the smallest of which extends approximately 3mm into the coenenchyme before narrowing and becoming a gastric canal (about 1mm in diameter). Among these polyps are much smaller coelenterons that extend only 1-1.5mm into the coenenchyme with no apparent gastric canal. These siphonozooids have well developed pharyngeal regions and intact peristomes that are minute rounded prominences. Apart from this they have no signs of anthocodial tissues (Fig. 2,s). The siphonozooids are scattered between the autozooids over the whole of the polypary. In the vicinity of the sectioning there is commonly only one between each fully developed autozooid and any of its immediate neighbours.

The spheroidal, often indented, reproductive bodies, identified by Hickson as spermaries, are present in large numbers and occur in both autozooids and siphon-

ozooids. In the autozooids there are 3-5 while the siphonozooids usually have one and occasionally two. The sperm sacs are about 0.6mm in diameter.

The largest of the expanded autozooids has a neck zone 3mm in length. The tentacles are 1.25mm long and have their inner face covered in a tangle of 60-80 digitiform pinnules. These pinnules are unusual in having about 6 constrictions along their length (Fig. 3c). The polyps are devoid of sclerites.

aperture the sclerites converge to form eight marginal lobes. In each lobe the sclerites become shorter and fewer, and change from well developed clubs to spindle-like forms closer to the oral aperture.

The surface of the stalk, sampled from the midway point, has sclerites like those of the polypary. There are also many large clubs, 0.17-0.36mm in length, with more elaborate heads and much wartier handles, and occasional spindles, rods

Fig. 2. *Acrophytum claviger*, paralectotype, enlargement of incised area; s, siphonozooids.

The whole of the surface of the stalk and the polypary is covered with a layer of minute, white, knobby spheres. These are the heads of club-shaped sclerites which are closely packed together and arranged perpendicular to the surface in a single layer (Fig. 2). The clubs of the polypary surface (Fig. 3a) can be up to 0.43mm long and the heads, ornamented with blunt upwardly directed projections up to 0.17mm wide. The majority, however, are 0.22-0.38mm long with heads <0.13mm wide. There are also a few clubs with markedly reduced heads that approach spindle form. These are 0.13-0.34mm in length (Fig. 3a').

In the surface area immediately surrounding a large retracted autozooid and poorly developed clubs (Fig. 4a).

The surface of the basal area of the stalk has numerous rods and irregular sclerite forms (Fig. 3b), but most are club-shaped, however, and 0.09-0.28mm long.

Sclerites are difficult to find in the interior of the colony. Inside the base of stalk there are small irregular rod-like sclerites and some longer spindles. The interior sclerites of the polypary are much rarer than those of the stalk. The few examined by individual selection from the incised area were of the same form as those of the stalk, although there were more spindles than rods. In both areas the sclerites were 0.1-0.36mm long (Fig. 4b).

The sclerites of the interior are of an

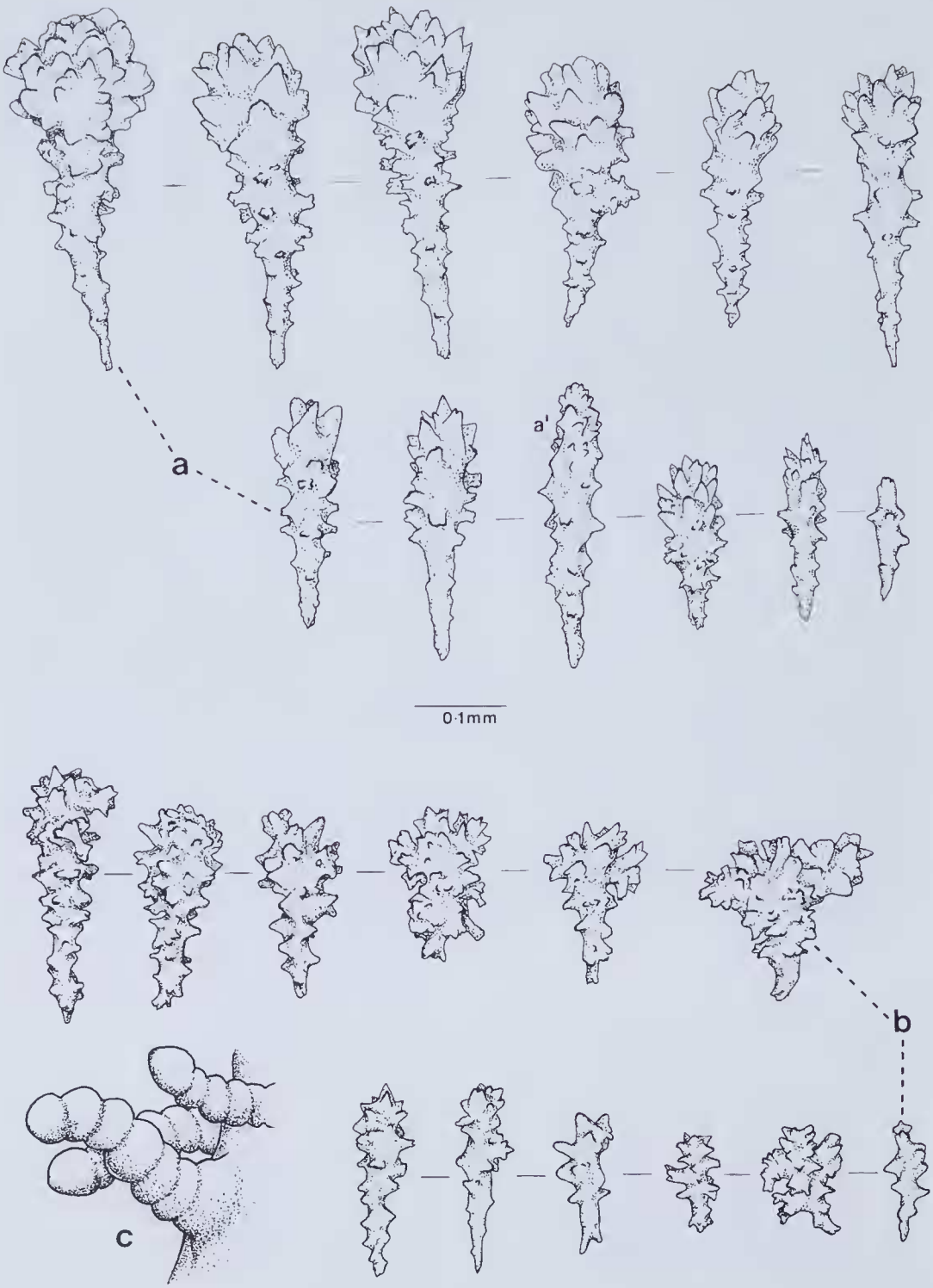

Fig. 3. *Acrophytum claviger*, paralectotype: **a**, sclerites from the surface of the polypary; **b**, sclerites from the surface of the stalk base; **c**, pinnules. Scale for sclerites only.

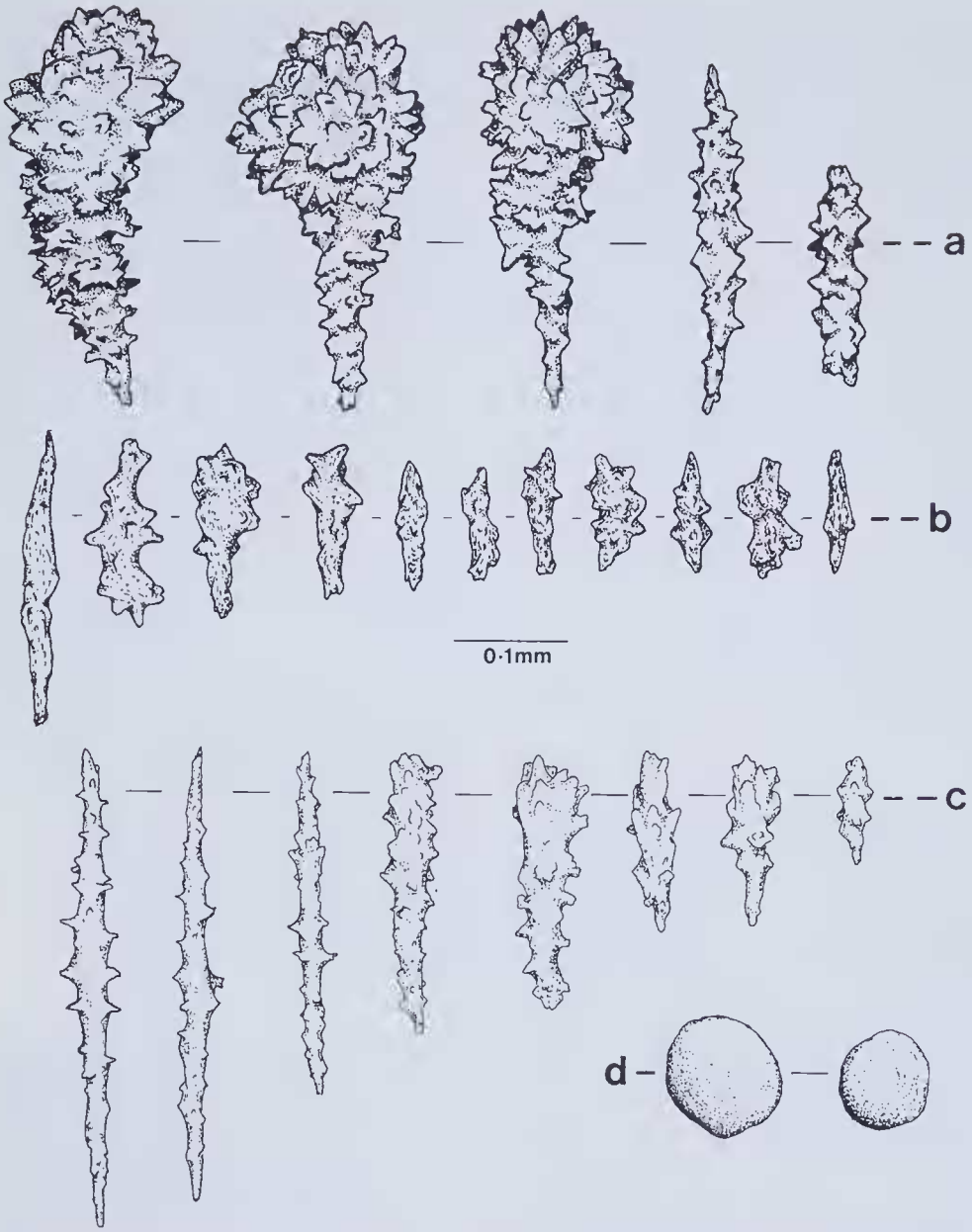

Fig. 4. *Acrophytum claviger*: **a**,**b**, paralectotype: **a**, sclerites from the surface of the middle zone of the stalk, **b**, sclerites from the interior of the polypary and the stalk; **c**,**d**, S.A.M.-H1039: **c**, sclerites from the interior of the polypary; **d**, unidentified coenenchymal sphcroids.

unusual construction. Microscopical examination using transmitted light reveals an apparent fibrous nature. During the process of removing individual sclerites from the coenenchyme they were seen to bend but not break. These sclerites are crushed by a microscope cover glass and leave a faint visible residue after treatment with hydrochloric acid. The general appearance of these sclerites is reminiscent of material that has been partially decalcified by initial storage in an acidic preservative, such as formalin. Comparative, examination of a specimen from the South African Museum also revealed several similar sclerites from the deeper layers of the coenenchyme. Those from more peripheral zones, however, are much more typical of alcyonaria as is shown in Fig. 4c. It seems most likely, therefore,

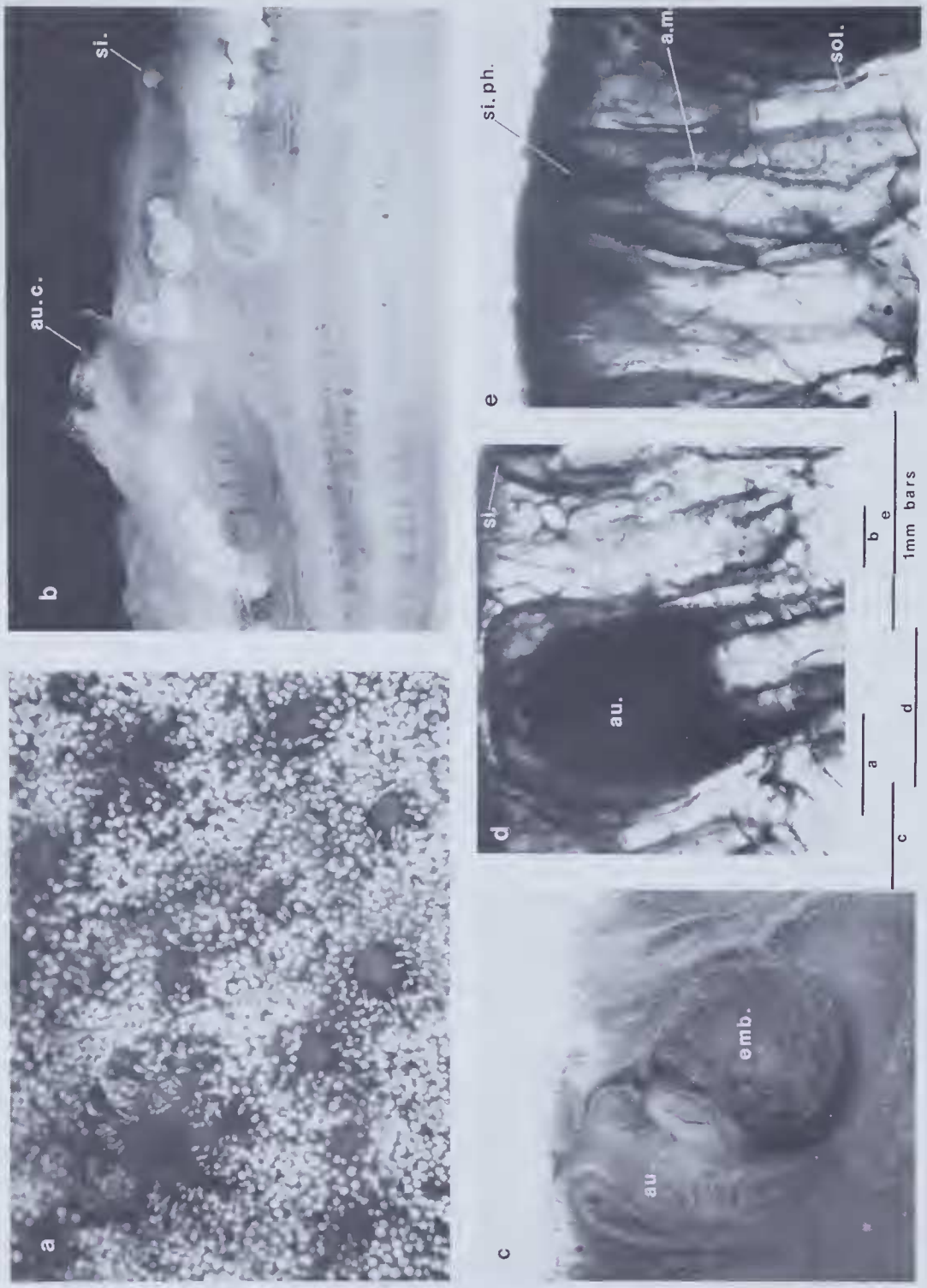

Fig. 5. **a,c-e,** *Acrophytum claviger* S.A.M.-H1039: **a**, colony surface; **c**, cut surface of the superficial layer; **d,e**, silhouetted thick section through superficial layer; **b**, *Minobea robusta* MSM-INV-75-048, cut surface of the superficial layer. Abbreviations: **a.m.**, sulcul mesentery; **au.**, autozooid; **au.c.**, autozooid calyx; **emb.**, embryo; **si.**, siphonozooid; **si. ph.**, siphonozooid pharynx; **sol.**, solenium.

that the condition of the interior sclerites in the paralectotype is an artifact. The paucity of these sclerites is the same in both specimens.

Histology. The following data are not from Hickson's specimen. The observations were made on a specimen from the old collection of the South African Museum loaned for limited dissection (S.A.M.-H1039).

The specimen is slightly larger than the paralectotype and is closely comparable to it in most other details. The colony, however, is female, all of the polyps are retracted, and the coenenchymal sclerites are as described above.

A close-up photograph of the surface of the polypary is shown in Fig. 5a, where small siphonozooids can be seen to greatly outnumber the larger autozooids. The white heads of the club-shaped surface sclerites are clearly seen also.

A thick decalcified section of the superficial layer, photographed with transmitted light, is shown in Fig. 5d,e. The extensive network of solenia that links all of the polyps is quite evident in both figures. In the siphonozooid shown at greater magnification in the second of the two figures, the pair of large asulcul mesenteries can be seen extending from the lower end of the pharynx to the limit of the gastric canal.

In transverse section the siphonozooids are easily distinguishable (Fig. 6a). They vary in diameter from 0.3 to 0.5mm, but all are identical in structure. The siphonozooids do not have tentacles. A short pharynx, 0.5mm, extends into the gastric cavity immediately below the oral aperture. The lateral and sulcul sides of the pharynx stain deeply and the siphonoglyph is very large. Only the asulcal pair of mesenteries, with their large filaments, extend below the pharanx, and they continue to the inner limit of the short gastric cavity. Figure 6a is a composite drawing depicting siphonozooids sectioned at different levels.

The colony is female and both ova and very large embryos are present. Oocytes were observed, in various stages of development attached to the mesenteries of the autozooids. No reproductive products were encountered in the siphonozooids. The largest oocyte measured 0.32mm in diameter and the large germinal vesicle and germinal spot could be seen clearly.

In his original description of *A. claviger*, Hickson refers to the unusually large ova, "nearly 2mm in greatest diameter", present in one of his specimens. The S.A.M. colony represents a more reproductively mature stage in having developing embryos present in the coenenchyme adjacent to autozooids. The colony proved exceptionally difficult to section. The initial method of preservation is unknown, and although most of the tissues sectioned adequately the embryos defied all attempts at successful wax embedding. The following description should be viewed in the light of this occurrence and a more detailed and accurate analysis must await the finding of fresh material from the coast of South Africa.

The embryos are irregularly pear shaped and 2-3mm at the greatest diameter. In other reports of Alcyonacea retaining fertilised eggs the developing embryos have been observed either in autozooid cavities or, as in the Xeniidae, in the distended solenia (Gohar 1940; Gohar and Roushdy 1961). The present case is closely analogous to that of the Xeniidae with one major difference; the mesogloeal cavity containing the embryo is connected by a short duct to the oral canal of the adjacent autozooid. Because all of the embryos are still in very early stages of development the duct is presumably a gonopore established well before the release of larvae. This is in contrast to the Xeniidae in which a temporary gonopore is formed by a rupture of the surface of the syndete just prior to larval extrusion.

A transverse section through the gonopore region of an embryo — autozooid pair is shown in Fig. 6a. Only seven of the intermesenterial compartments of the autozooid are visible. All eight are shown in Fig. 6b, where the section was taken a little deeper. Not all autozooids have embryos. Those that do, have only one embryo, and it is situated on the sulcul side.

The gonopore is lined with gastrodermis which extends part of the way down into

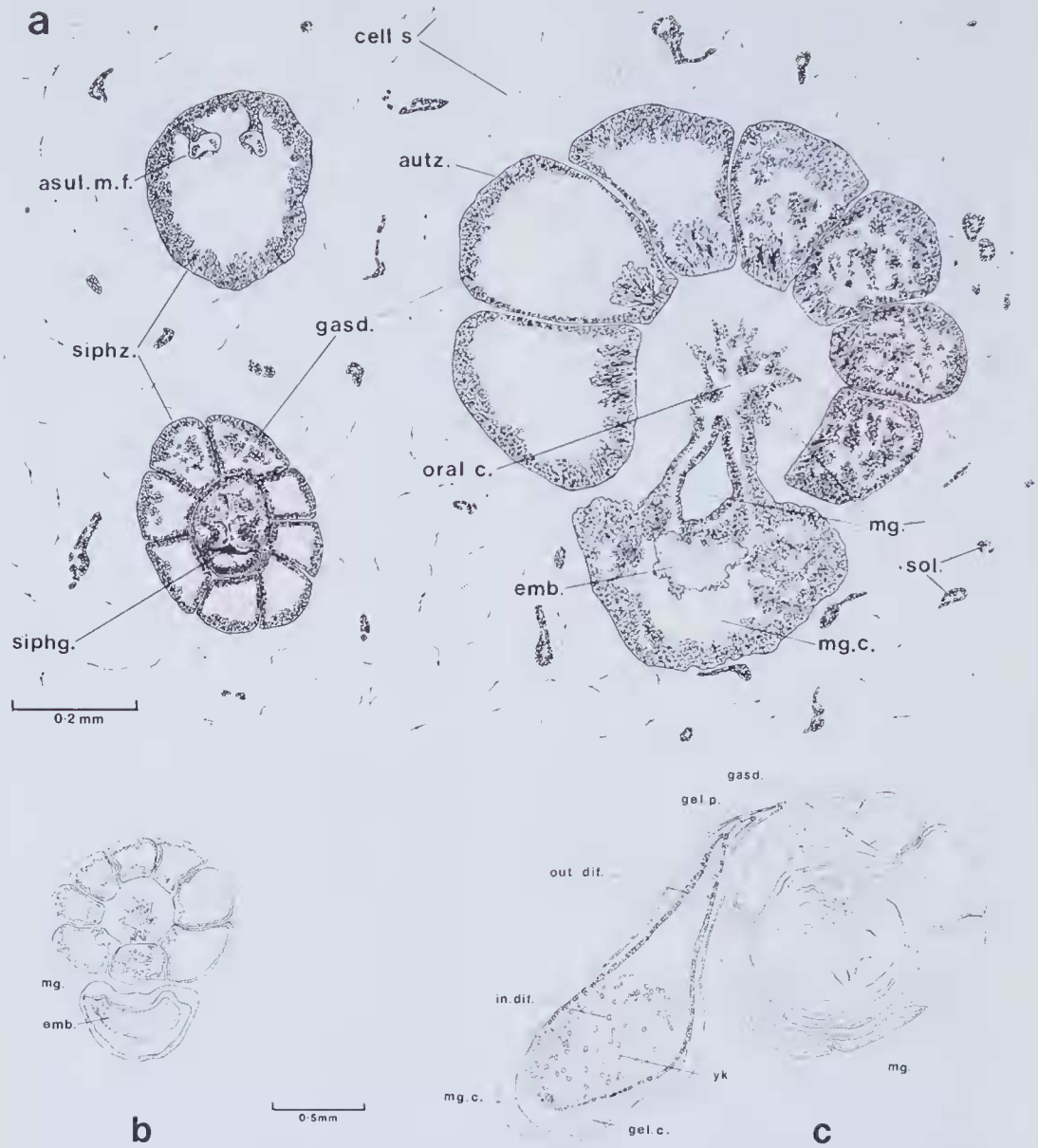

Fig. 6. *Acrophytum claviger* S.A.M.-H1039: **b**, transverse section through siphonozooids and an autozooid-embryo pair in the region of the gonapore; **b**, transverse section through autozooid and embryo. **c**, oblique section through autozooid and embryo. Abbreviations: **asul. m.f.**, asulcul mesenterial filament; **autz.**, autozooid; **cell s.**, cell strings; **emb.**, embryo; **gasd.**, gastrodermis; **gel.c.**, gelatinous mesogloeal cap; **gel. p.**, gelatinous mesogloeal plug; **in dif.**, interior differentiating layer; **mg.**, mesogloea; **mg.c.**, mesogloeal cavity; **oral c.**, oral canal; **out. dif.**, outer differentiating layer; **siphg.**, siphonogyph; **sipbz.**, siphonozooid; **sol.**, solenia; **yk.**, yolk.

the mesogloeal cavity (Fig. 6a, b,c). This indicates the cavities are of endodermal origin, as in the Xeniidae. The entrance to the gonopore is blocked by a plug of deeply staining gelatinous mesogloea in the tip of the cavity. There is a cap of the same material on the lower end of the embryo. These regions can clearly be seen in the cut surface photograph (Fig. 5c). A thin outer layer of differentiating ectoderm (cells and large yolk granules) is present in some regions of the embryo. This layer appears to merge with the interior matrix of differentiating endoderm where aggregations of cells and yolk granules occur. The yolk is most

noticeable, occurring as large, clear, capsule — like structures up to 0.07mm in diameter.

During dissection of the S.A.M. colony numerous unusual, white, spheroidal objects, up to 0.1mm diameter, were observed in the deeper layers of the mesogloea of the polypary. The objects (Fig. 4d) were resistant to sodium hypochlorite, hydrogen peroxide and hydrochloric acid, and their identity remains unknown.

Discussion. *Minabea robusta* Utinomi and Imahara 1976, has several similarities to *A. claviger*; namely the digitiform morphology, the canal system and the occurrence of both fertile autozooids and siphonozooids. However, the colourless nature and the form of the sclerites in *A. claviger*, its dense mesogloea, the extreme paucity of interior sclerites and the smaller number of siphonozooids seem sufficient evidence to maintain their systematic separation. The question of synonymy remains however, still uncertain. Upon re-examination of *M. ozakii* Utinomi 1957, the type species of the genus, Utinomi reversed his opinion that the siphonozooids were fertile. This information has not been published, and has been communicated to me by Dr F.M. Bayer from his correspondance with Utinomi. A portion of the paratype of *M. robusta* (MSM-INV-75-048) is shown in Fig. 5b. Both autozooids and siphonozooids are clearly fertile. I have been unsuccessful in obtaining any type material of *M. ozakii*. The question may not be resolved until both male and female fertile colonies of the *Minabea* species are examined.

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